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# ANALYSIS OF STUDENTS' PROBLEM SOLVING ABILITY ON GRADE VII IN LINEAR EQUATIONS AND INEQUALITIES OF ONE VARIABLE

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## Abstract

This study was a qualitative research. The purpose of this study was to determine students' mathematical problem solving ability on grade VII on linear equations and inequalities of one variable.The research was conducted at SMP Negeri 9 Palopo the academic year 2015/2016.The instrument used in this study were (1) test problem solving ability (2) guidelines for the interview.Data analysis techniques in this study consisted of (1) data reduction, (2) data presentation, (3) verification and conclusion.The indicators of students' problem solving that are (1) understand the problem,(2) formulate a plan of solving problem, (3) implement theplan ofproblem solving, (4) review.Research results obtained on a subject of high rate capability (SH), a subject of medium capability (SM), the subject of lowcapability (SL) on each of the indicators, among them are;1) the subject of high rate capability (SH) in problem solving can complete four stages of Polya well. Difficulty experienced by SH in solving linear equations and inequalities of one variables is skill difficulty,2) the subject of medium capability (SM) in problem solving can complete four stages Polya, but incomplete. This subject is said to be still lacking in resolve the problem solving. Difficulties experienced by the subject of medium capability(SM) in solving linear equations and inequalities of one variable were the principle difficulty and skill difficulty,3) the subject of low capability (SL) in problem solving, gave no completion indicator correctly so that the subject is considered still low in problem solving.Difficulties experienced by SL in solving linear equations and inequalities of one variables were difficultyof concept, principle, and skill.

**Keywords**: Analysis, problem solving, difficulty, equations, inequalities

## 1. Introduction

School mathematics curriculum based competence (Depdiknas, 2003), suggests that the general objective of mathematics education is emphasized to the students to have: (1) the ability related to mathematics that can be used in solving mathematical problems, another lesson, or problems related to real life, (2) the ability to use mathematics as a tool of communication, and (3) the ability to use mathematics as a way of reasoning that can be transformed to use in every situation, such as critical thinking, logical thinking, systematic thinking, be objective, be honest, be disciplined in looking at and resolving problem.Reality on the ground, the process of teaching and learning activities in the classroom, learning subjects, especially mathematics exact response was unfavorable. As stated Ruseffendi (2014), mathematics (science) for children in general is a subject that is unpopular, if not hated lessons.

One thing to note in this regard is to examine the factors that cause the difficulties experienced by students in solving mathematical problems. Factors that cause these

difficulties meant that the students in solving mathematical problems conscious of his ability, for example, the ability to complete mathematics problems related to everyday life. In fact right now there are still shortcomings that occurred, one of which is the ability of students are still lacking in solving problems. Deficiencies in question here is the ability of students in translating word problems into mathematical models, which subsequently resolved without taking previous conclusions.

One of the capabilities that are important and are expected to be mastered by students of SMP is problem solving ability on the material linear equations and inequalities of one variable. The materials in addition to dealing with everyday life also plays a role in the control of other materials. This is important because of the linear equation and inequality of one variable is one of the materials that are considered difficult in mathematics, one reason is that material is usually a matter of a story that requires a high ability to learn. Widdiharto (2008) stated that the difficulties in mathematics is characterized by not remembering one condition or more than a concept. Such findings indicate that students are still experiencing difficulties in translating word problems. The cause of these difficulties is not mastered the concept, especially if only read without interpret its meaning. It is certainly difficult for students to express them back.

The importance of solving the problem was also confirmed in NCTM (2000) which states that solving the problem is an internal part in the study of mathematics, so it should not be released from the learning of mathematics. The standard of NCTM's problem solving stipulates that the teaching programs from pre-kindergarten to grade XII should enable students to: 1) build a new mathematics knowledge through problem solving, 2) solve problems that arise in mathematics and in other contexts, 3) implement and customize a variety of appropriate strategies to solve the problem, 4) monitor and reflect on the process of mathematical problem solving.

Based on the explanation above, the purpose of this study was to determine the ability of students' mathematical problem solving on grade VII on the linear equations and inequalities of one variable.

**a. Problem Solving Ability**

Polya (1957) defines "problem solving as an effort to find a way out of a difficulty in order to achieve a goal that is not so easily soon be achieved".Problem solving ability is an action to resolve the problem, which is also a method of discovery solutions through the stages of problem solving. Can also be regarded as a problem solving effort to find a way out of a difficulty. Problems arise because of the gap between what is expected to happen exactly, between what is owned to what is needed, between what is known to associate with a particular problem with what is to be known.

According to Lestari (2014), mathematical problem-solving ability is the mental activity of a person in solving mathematical problems with the knowledge and experience possessed. By Polya (1957), there are four steps in solving problems which include: (1) understand the problem of identifying the elements that are known, were asked, and the adequacy of the required elements; (2) planning, problem solving, which is preparing a mathematical model; (3) implement the problem solving planning, namely solve the problem in accordance with the plan that had been developed; (4) the re-examination, that explain/interpret the results as the origin of the problem.

**b. Linear Equation and Inequality of One Variable**

Equality is an open sentence that states the relationship of "equals" while inequality is an open sentence that states the relationship $<$, $\leq$, $>$, $\geq$ or $\neq$. For example, in the form$x + 2 < 5$said an inequality that contains a variable (in this case $x$) is variable with the power is one.

Example

1) Circumference of a rectangleis 98 $cm$. Find the area, if the length is $(x + 5)$ cm andthe width is$x$ cm.

Answer:

Width ($l$) = $x$ cm

Circumference= 98 cm and length ($p$) = ($x$ + 5) cm

The circumference is (k) = 2 (p + $l$)

$98 = 2\ (x + 5 + x)$

$98 = 2\ (2x + 5)$

$98 = 4x + 10$

$4x = 88$

$x = \frac{88}{4}$

$x = 22$

So:

Width ($l$) = 22 cm and length ($p$) = 22 + 5 = 27 cm

The area of rectangle is ($L$) = $P \times l$

$= 27\ cm \times 22\ cm$

$= 594\ cm^2$

2) The length of a rectangle is 6 $cm$ more than its width, and its circumference less than 40 $cm$. If the width $x$ $cm$, count the inequalities in $x$ and solve it.

Answer:

Width = $x$ cm

Length = ($x$ + 6) cm

Circumference = 2p + 2$l$

$2p + 2l < 40$

$2(x + 6) + 2x < 40$

$2x + 12 + 2x < 40$

$4x + 12 < 40$

$4x < 40 - 12$

$4x < 28$

$4x : 4 < 28 : 4$

$x < 7$

So, the possible width of the rectangle is 1, 2, 3, 4, 5 and 6

## 2. Method

This research was conducted at SMP Negeri 9 Palopo,Subdistrict Telluwanua, Palopo. The timing of this research is in the second semester of the academic year 2015/2016. The type of this research is categorized in qualitative research. Qualitative research aims to understand the phenomenon of what is experienced by the subject of research, for example, the behavior, perception, action and others. This study has only one variable that problem solving ability.

These research subjects are 3 students of grade VII SMPN 9 Palopo. All students are divided into high-ability students, medium, and low-ability when viewed in terms of problem solving ability. Selection techniques on these subjects is to provide mathematical problem solving test in the form of questions relevant descriptions of linear equations and inequalities in one variable, they have learned.

The type of research instrument used to collect data in this study was: (a) problem solving ability test, a test that is used in the form description (essay) as many as 5 numbers, (b) guidelines for the interview. Data analysis technique in this research is descriptive analysis with the following stages: (1) data reduction, (2) data presentation, (3) makes coding, (4) the verification of data and conclusion.

## 3. Finding and Discussion

Determination of study subjects according to the results of the test problem solving ability, are then categorized into high ability (SH), medium ability (SM) and low ability (SL), as well as interviewed for analyzing the student's difficulties in solving the linear equations and inequality of the one variable that consists of 5 questions.

### a. Student of High Capability(SH)

Difficulties of highly capable subject (SH) in solving problem of the linear equations and inequalities of one variable at every stage is declared as follows:

1) Understand the problem

The subject of high-ability (SH) in solving linear equations and inequalities of one variable in the fifth question was no trouble. This is evident from the results of the solution who wrote what is known and what is asked on the answer sheet. It's just that the SH does not write what is known and asked in Question 3 for forgetting to write it, but the SH can reveal what is known and asked correctly at the interview.

2) Formulate a plan for solving problem

SH in formulating plans of problem solving on the fifth diagnostic tests explicitly perform the initial allegations by substituting what is known and understood into a formula. This is demonstrated implicitly. SH experienced a difficulty in Question 5 that does not know how the next steps that are used to solve the problem.

3) Implement the plan of problem solving

The subject of high ability (SH) in conducting the plan of problem solving of the fifth problems about diagnostic tests can operate the values correctly. But in the question no 5, SH has difficulty in continuing the solution step so the solution step are not systematic. This is caused the subject of high ability does not know how the next steps that are used to solve the number 5.

4) Review

The subject of high-ability (SH) in a review what was written and expressed confidence that every step solution is correct and appropriate in the number 1, number 2, number 3 and number 4, but in question number 5 could not finish.

### b. Student of Medium Capability (SM)

Difficulties of medium capable subject (SM) in solving problem of the linear equations and inequalities of one variable at every stage is declared as follows:

1) Understand the problem

Subject of medium capability (SM) in understanding the problem no trouble. This is evident from the results of the solution to write or express what is known and what is being asked.

2) Formulate a plan for solving the problem

SM in formulating plans of problem solving on the fifth diagnostic tests explicitly perform the initial allegations by substituting what is known and understood into a formula,but in question number 3 and number 5 the SM subject has difficulty in substituting what is known into a formula. This looks that SM did not know the first steps to solve them.

3) Implement the plan of problem solving

The subject of mediumcapability (SM) in conducting the plan of problem solving on the fifth problems about diagnostic tests can operate the values into formula correctly and appropriately, but in question number 3 and number 5 the SM has difficulty in operating values. This is because the SM does not know the formula that is used to search for mathematical models.

4) Review

The subject of medium-ability (SM) in review what has been written in the fifth question about diagnostic test looks can write the conclusion at the question number 1, number 2 and number 4,while the question number 3 and number 5 the SM cannot write the conclusion or do not express a given problem. This is because the SM could not finish and did not know what the formula is used.

**c. Student of Low Capability (SL)**

Difficulties of low capable subject (SL) in solving problem of the linear equations and inequalities of one variable at every stage is declared as follows:

1) Understand the problem

SL in understanding the problem in linear equation and inequality on the fifth question does not write what is known and what is being asked. This is because the SL considers unimportant and does not need to write it down.

2) Formulate a plan of solving the problem

Subject of low capability (SL) in formulating the plan of problem solving in the question number 1 and number 2 is to do the initial allegations by substituting what is known into a formula, but in question number 3, number 4 and number 5, SL in formulating the problem solving plan does not substitute what is known into the formula and did not finish. This is because he does not know the solution steps.

3) Implement the plan of problem solving

SL in conducting plans on the fifth problems experienced difficulties in question number 3, number 4 and number 5. SL had trouble because it does not resolve the given problem. This is due to he considers that question is difficult and does not know the solution step.

4) Review

SL in a look back at what has been disclosed and written experience difficulties at any given problem. In question number 1 and number 2,SL subject has difficulties in terms of concept. In question number 3, number 4 and number 5, SL had difficulty in completing the given problem.

Based on the stages of problem solving that has been carried out by three subjects, it can be described the difficulty of the high capability subject (SH), a medium capability subject (SM) and the low capability subject (SL) on indicators of difficulties as follows:

1) Conceptual Difficulty

The SH and SM had no trouble in a given problem, but it is different with the SL subject have difficulty in completing a given problem.

2) Principle Difficulty

The SH has no trouble on this indicator in solving a given problem. On the SM experienced difficulties in question number 3 and number 5, while the SL experienced difficulties in question number 3, number 4 and number 5.

3) Skilldifficulty

The subject of high-ability (SH), a subject of medium-ability (SM) and the subject of low-ability (SL) had trouble on this indicator in solving a given problem. the SH only have difficulty in Question 5, and then on the SM have difficulties in question number 3 and number 5, while the SL experienced difficulties in question number 3, number 4 and number 5.

## 4. Conclusion

Problem solving mathematical ability of students on the material linear equations and inequalities of one variable is as follows:

a. The subject of high rate capability (SH) in problem solving can complete four stages of Polya wellness. Difficulties experienced by SH in solving linear equations and inequalities of one variable are skill difficulties.
b. The subject of medium capability (SM) in problem solving can complete four stages Polya, but incomplete.This subject is said to be still lacking in resolve the problem solving. Difficulties experienced by the subject of medium capability (SM) in solving linear equations and inequalities of one variable are the principle difficulties and skill difficulties.
c. The subject of low capability (SL) in problem solving, gave no completion indicator correctly so that the subject is considered still low in problem solving.Difficulties experienced by SL in solving linear equations and inequalities of one variable are difficulty of concepts, principles, and skills.

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